

Environmental Observations Taken Aboard the OR3

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Outline

OR3 Environmental Instruments

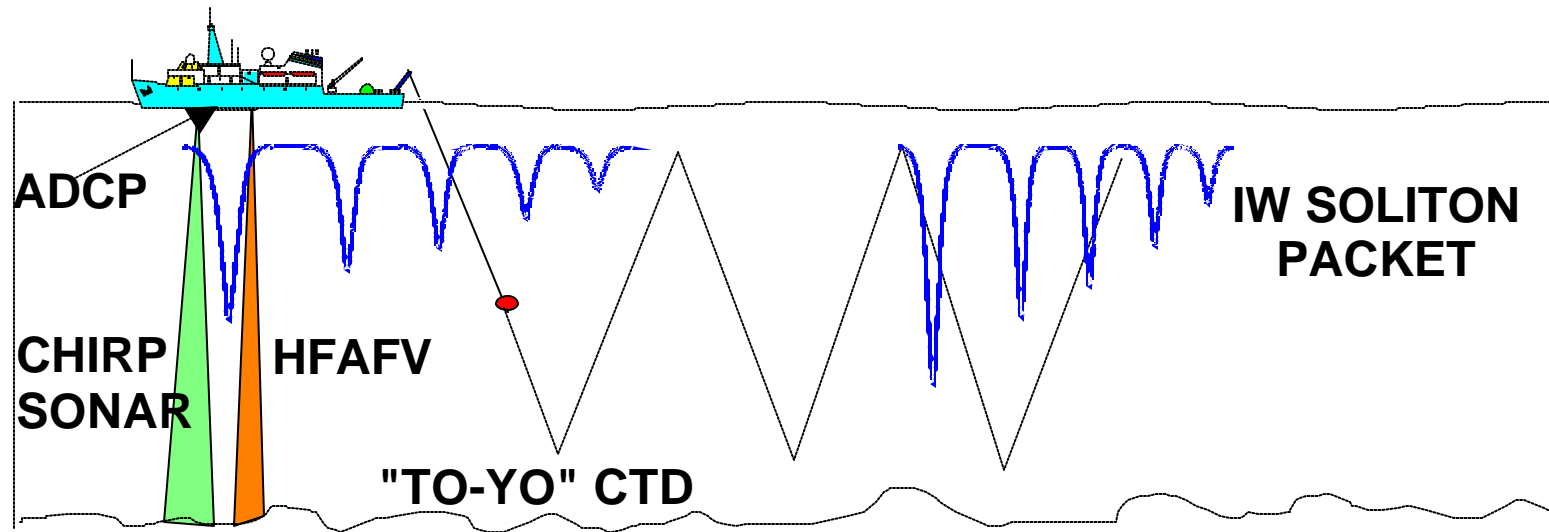
OR3 Ship Tracks

Temperature and Salinity Profiles

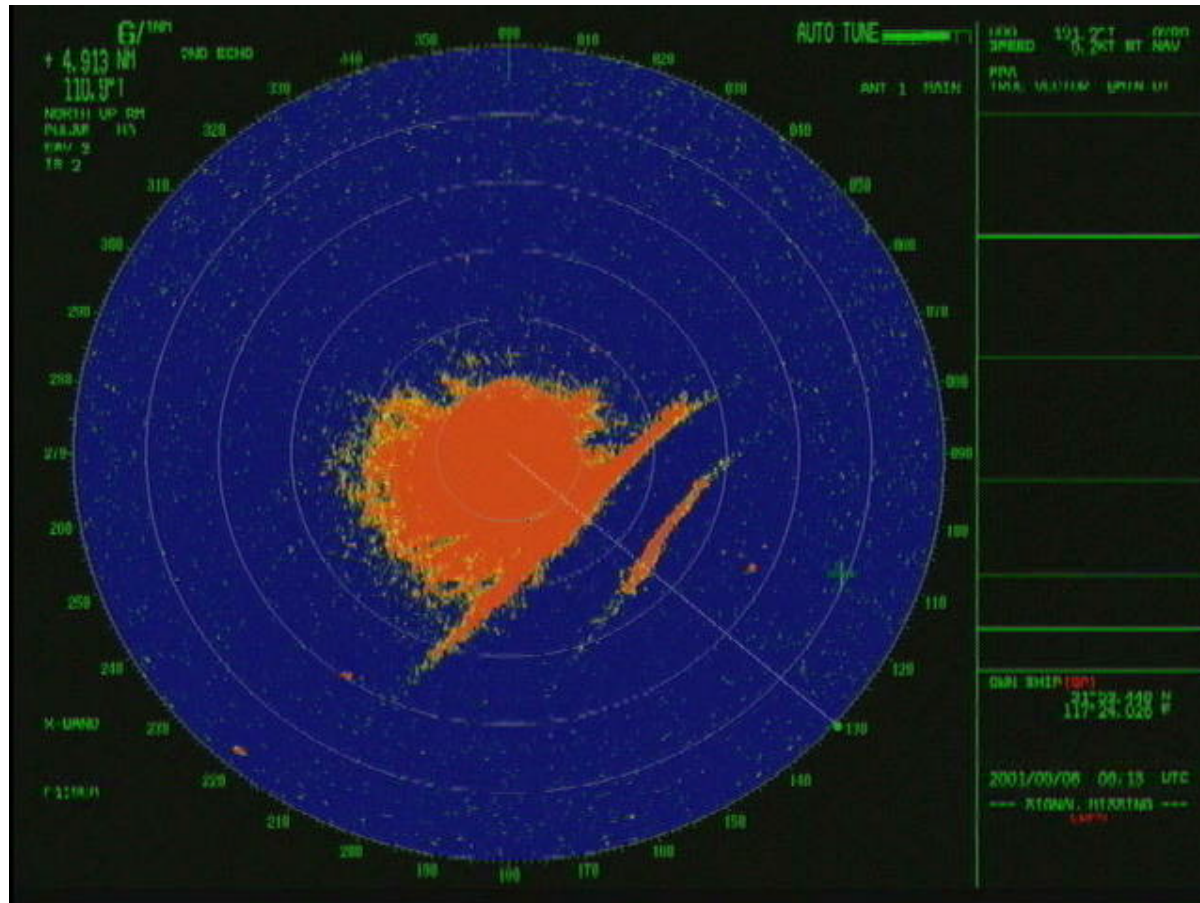
Deep Water Soliton

Shallow Water Soliton Conversion

Towed Environmental Instruments



Soliton Radar Expression

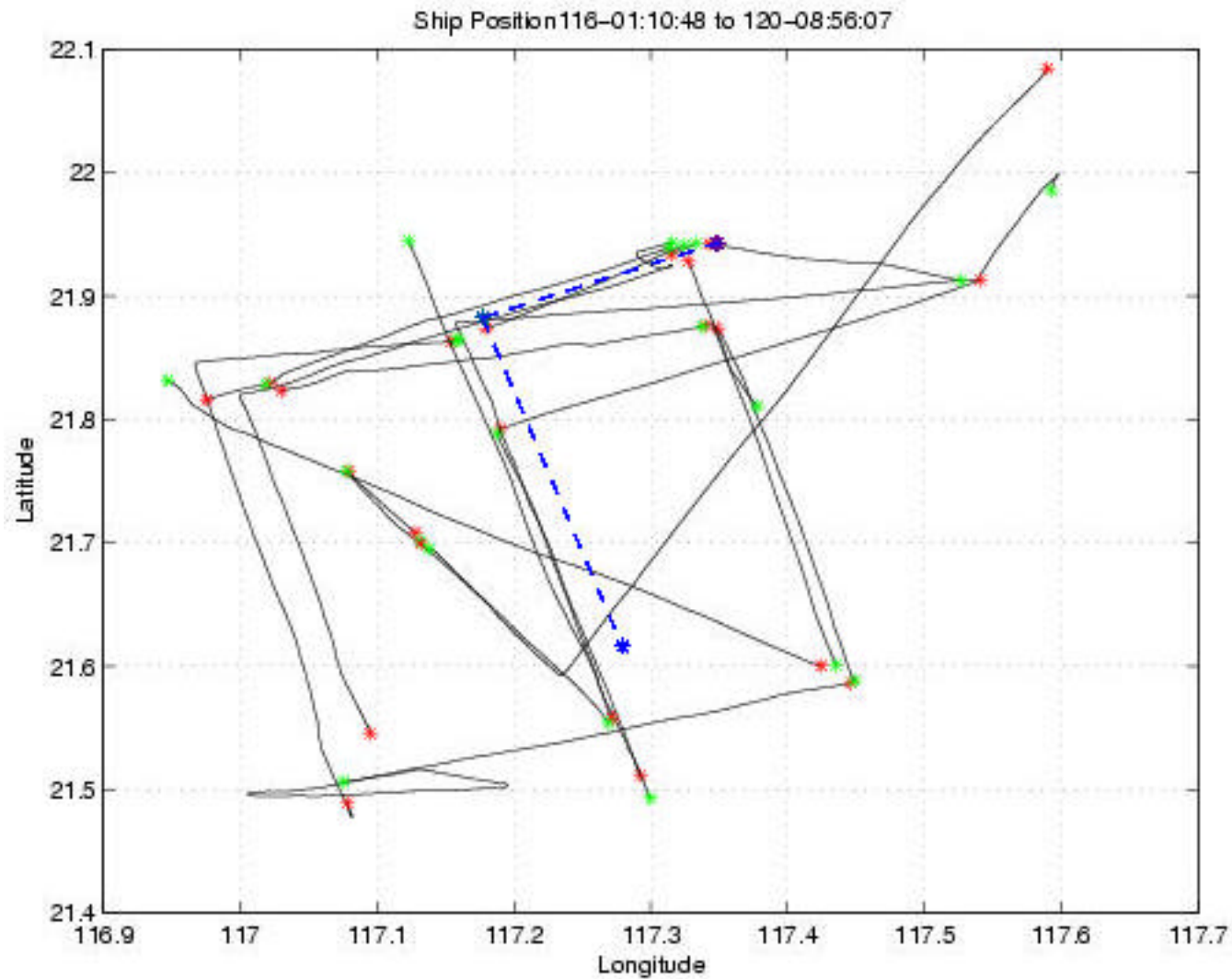


ONR

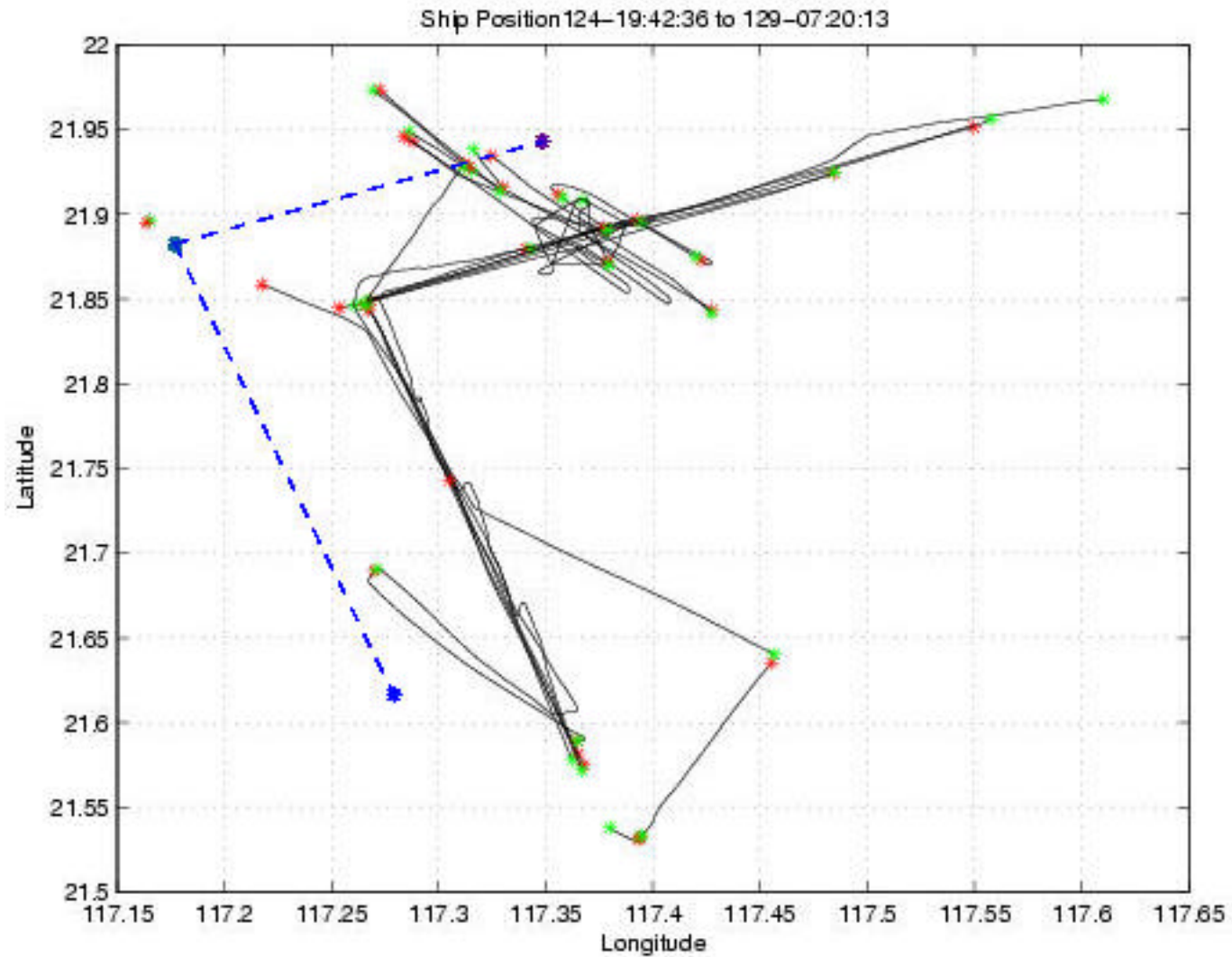
NRL

OR3 Ship Tracks

OR3 Tracks Leg 1



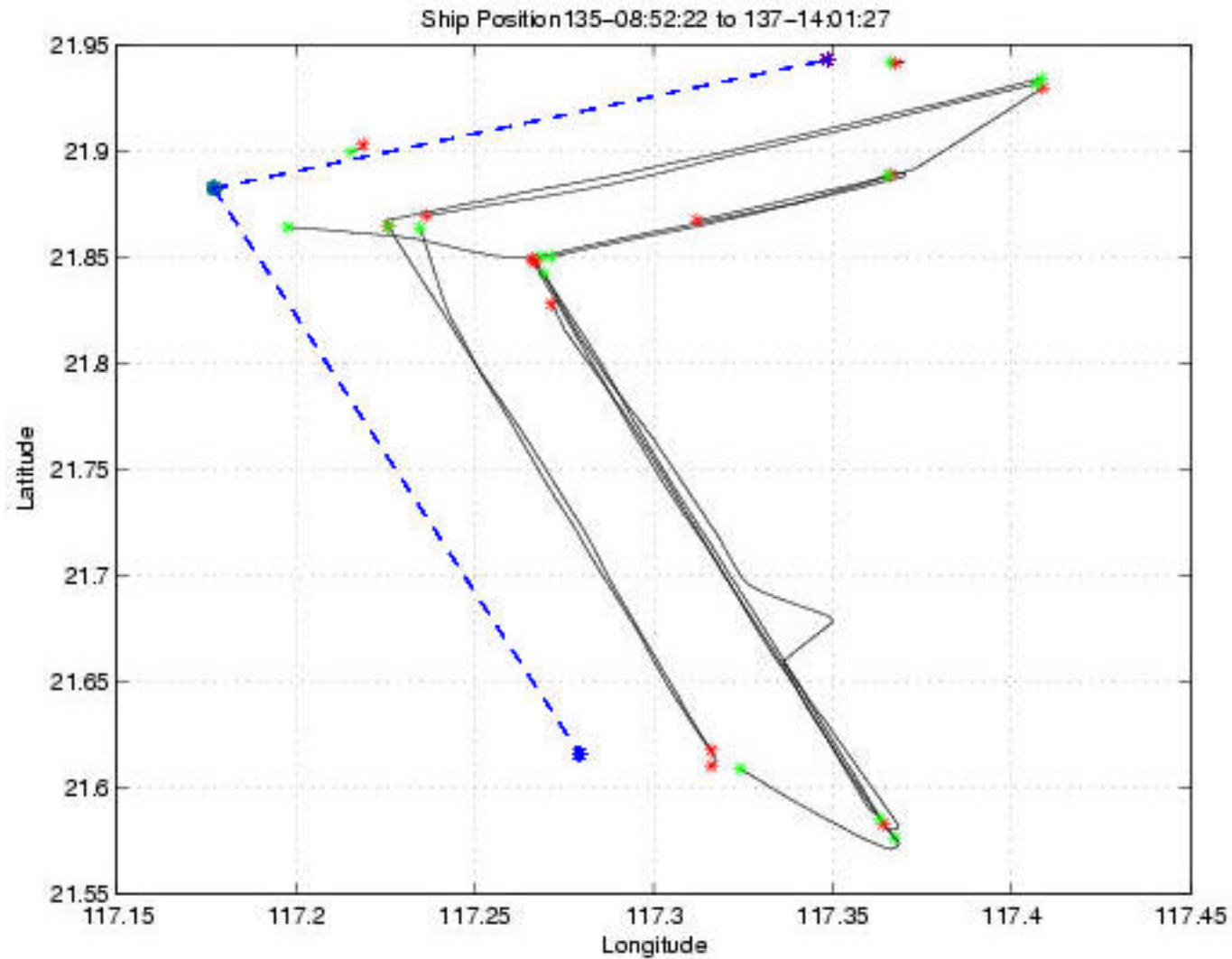
OR3 Tracks Leg 2



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OR3 Tracks Leg 3

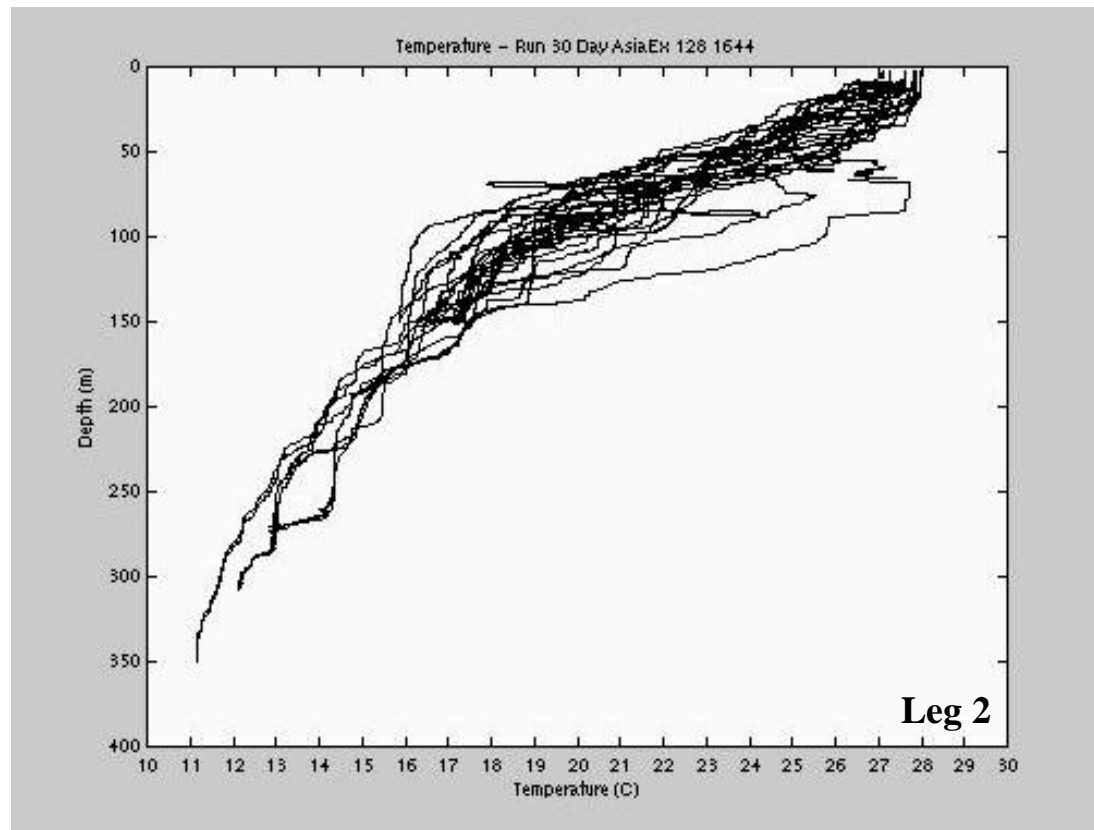


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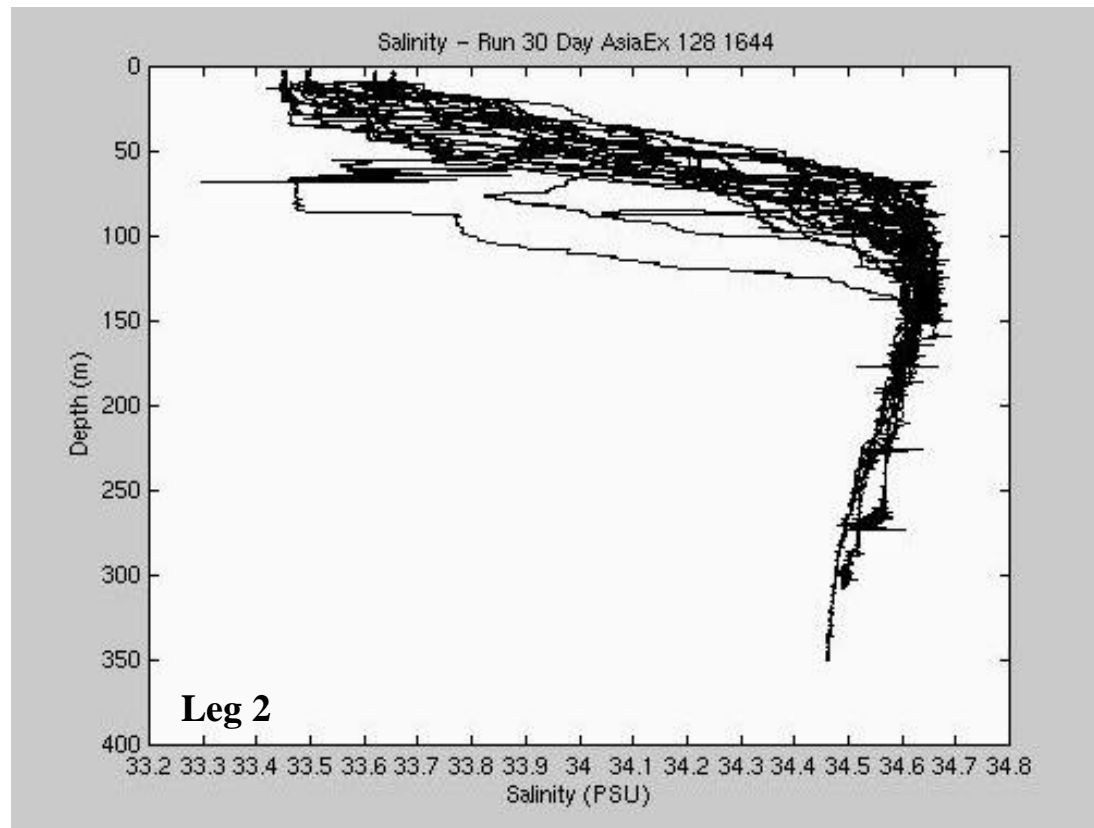
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Temperature and Salinity Profiles

Temperature

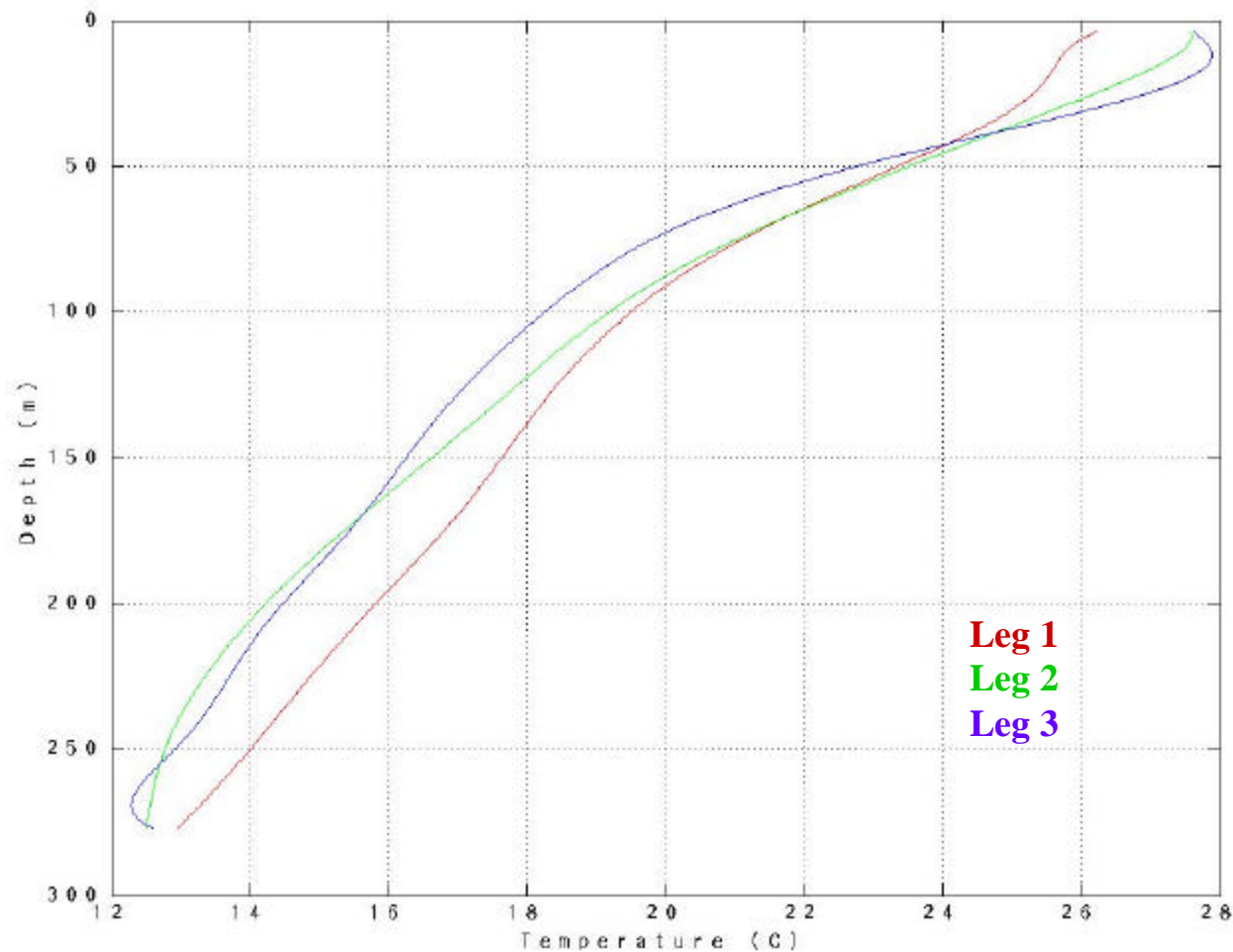


Salinity



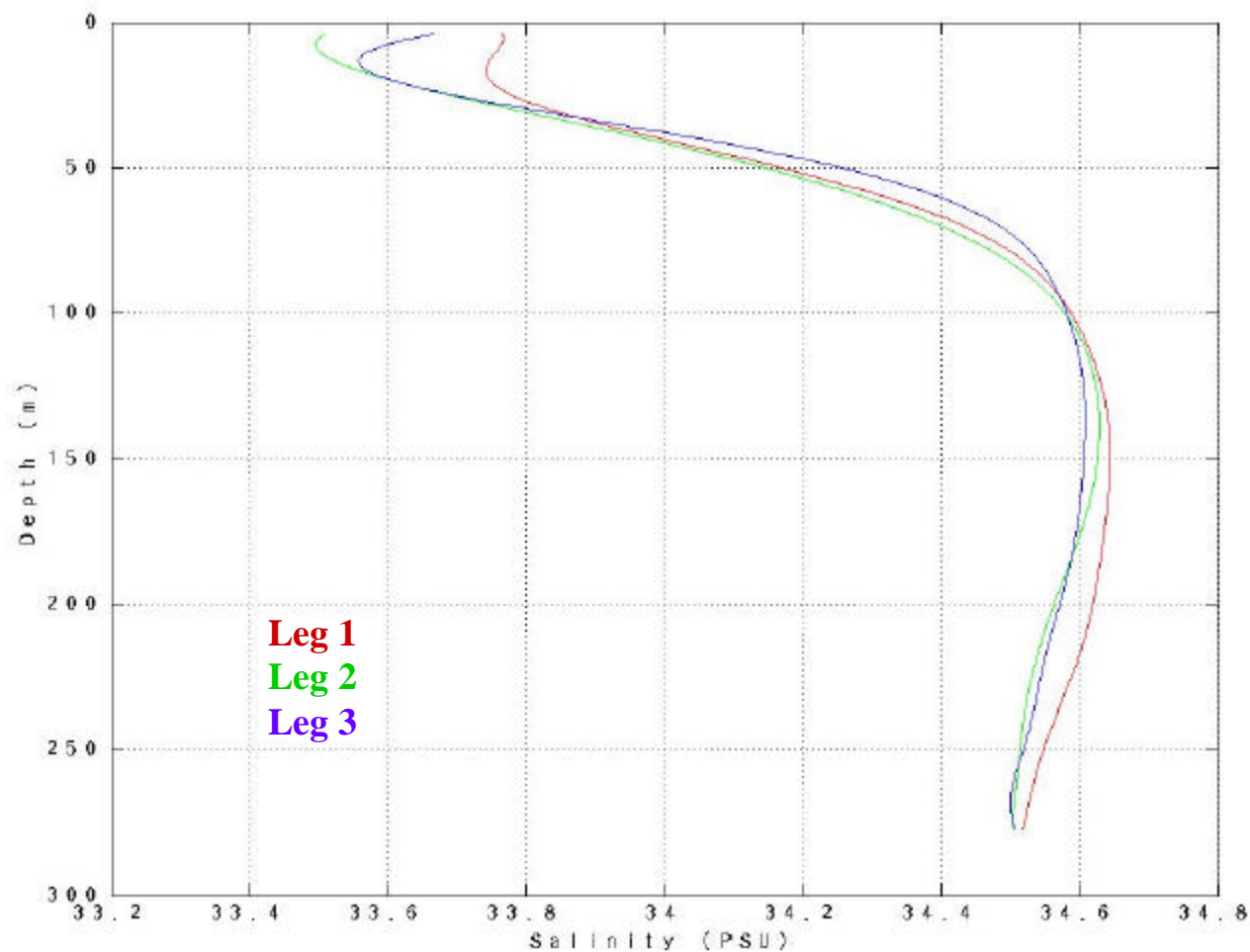
Temperature

(12th Order Least-Squares Polynomial)



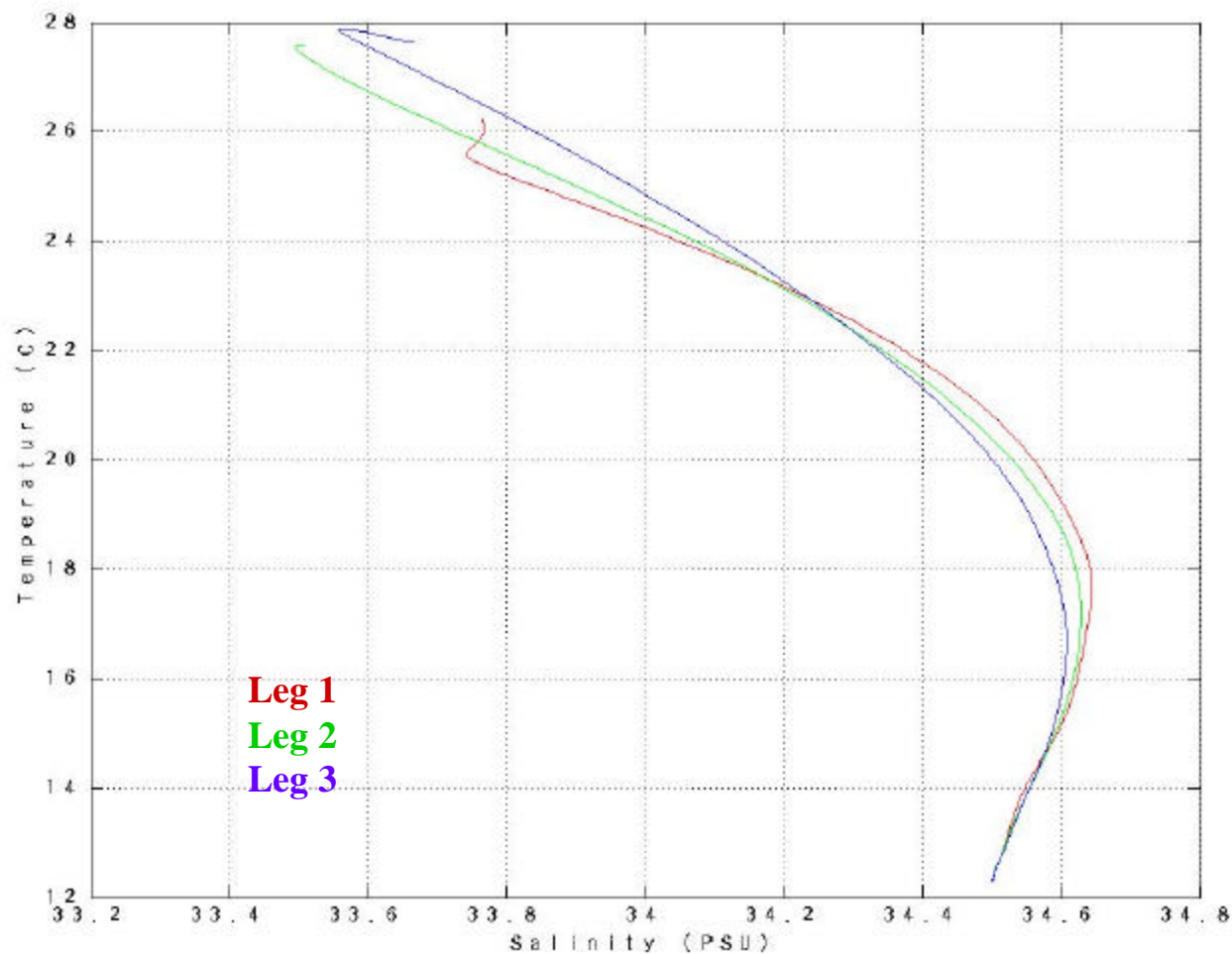
Salinity

(12th Order Least-Squares Polynomial)

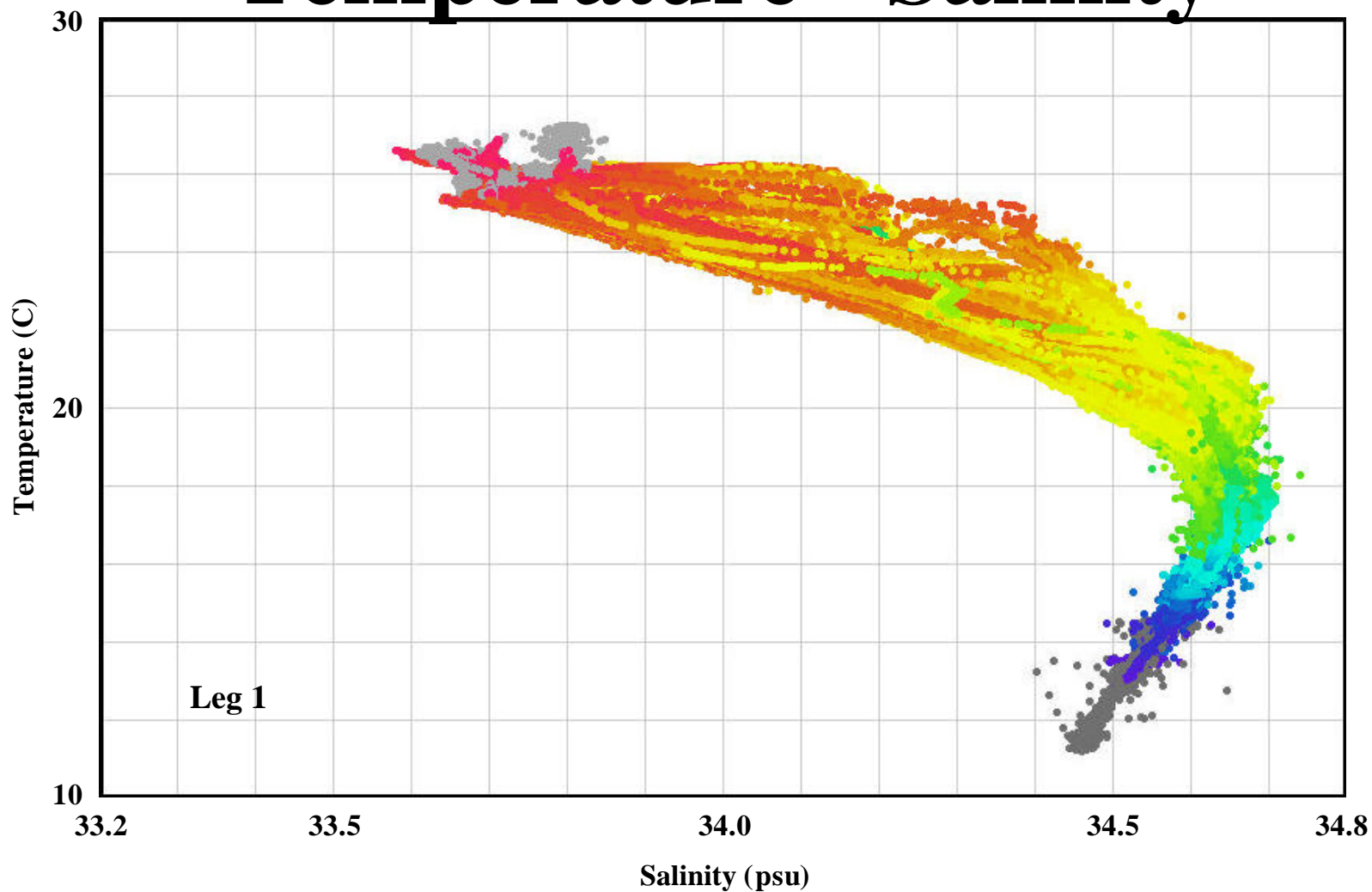


Temperature - Salinity

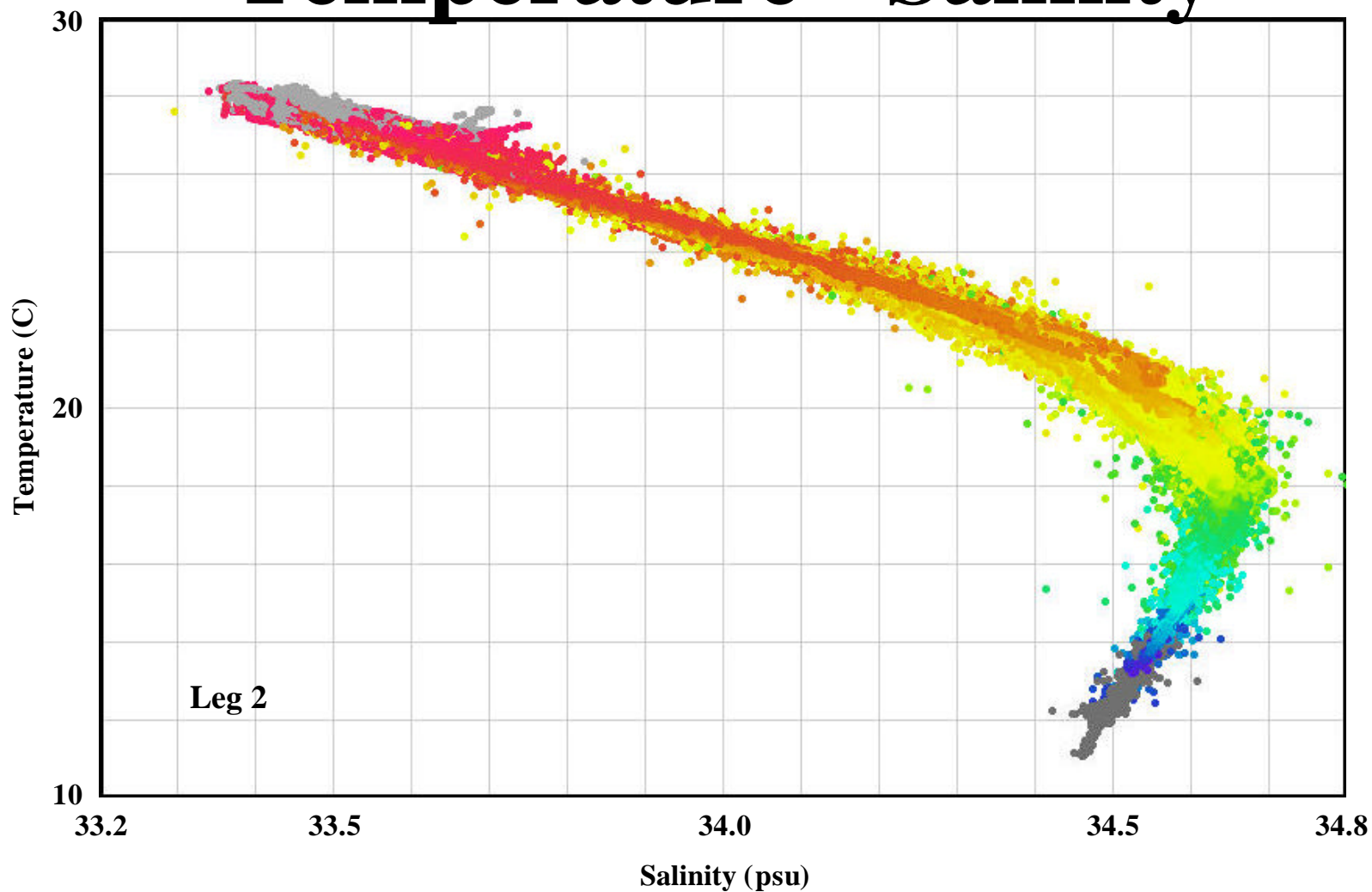
(12th Order Least-Squares Polynomial)



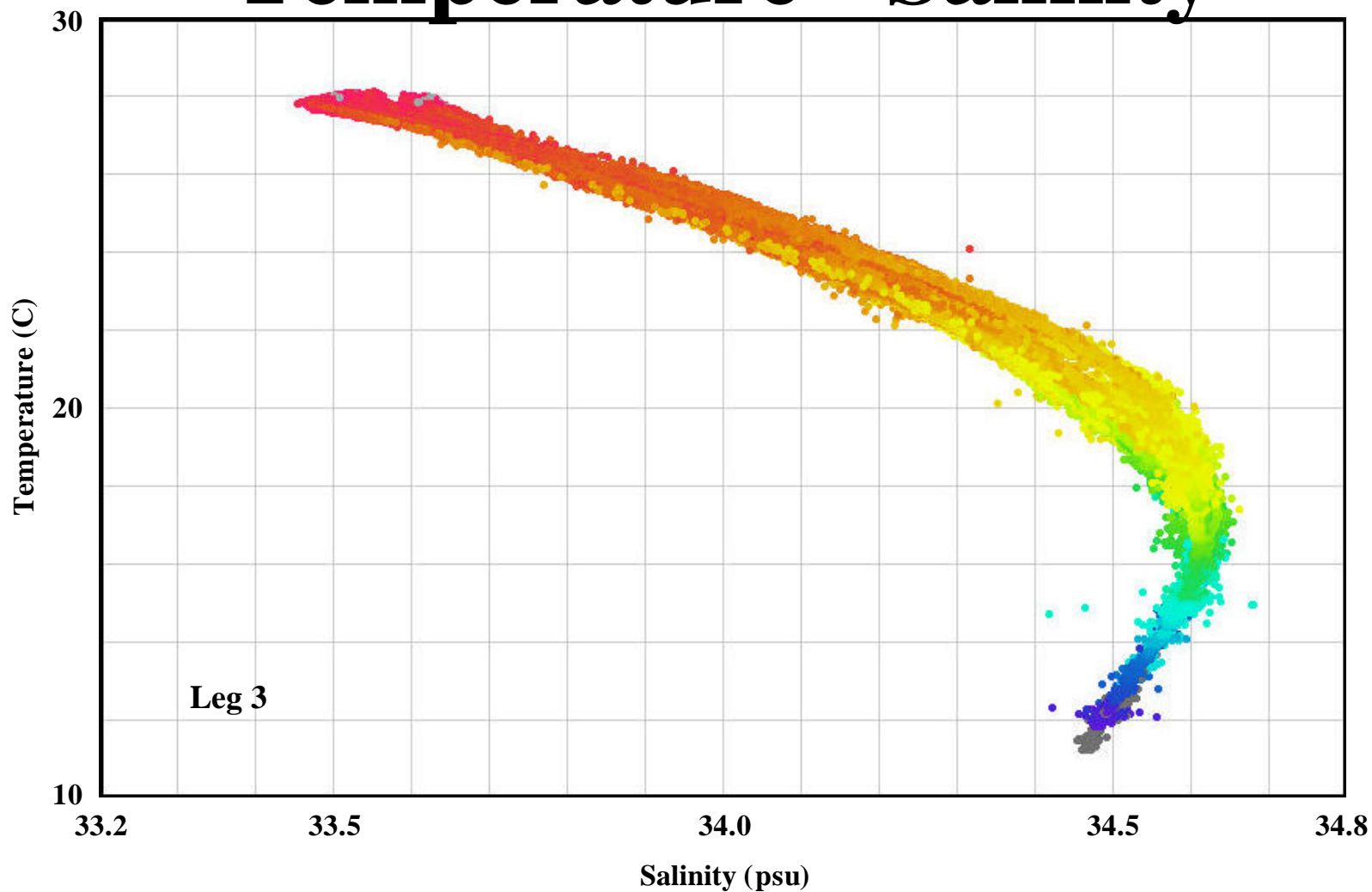
Temperature - Salinity



Temperature - Salinity



Temperature - Salinity

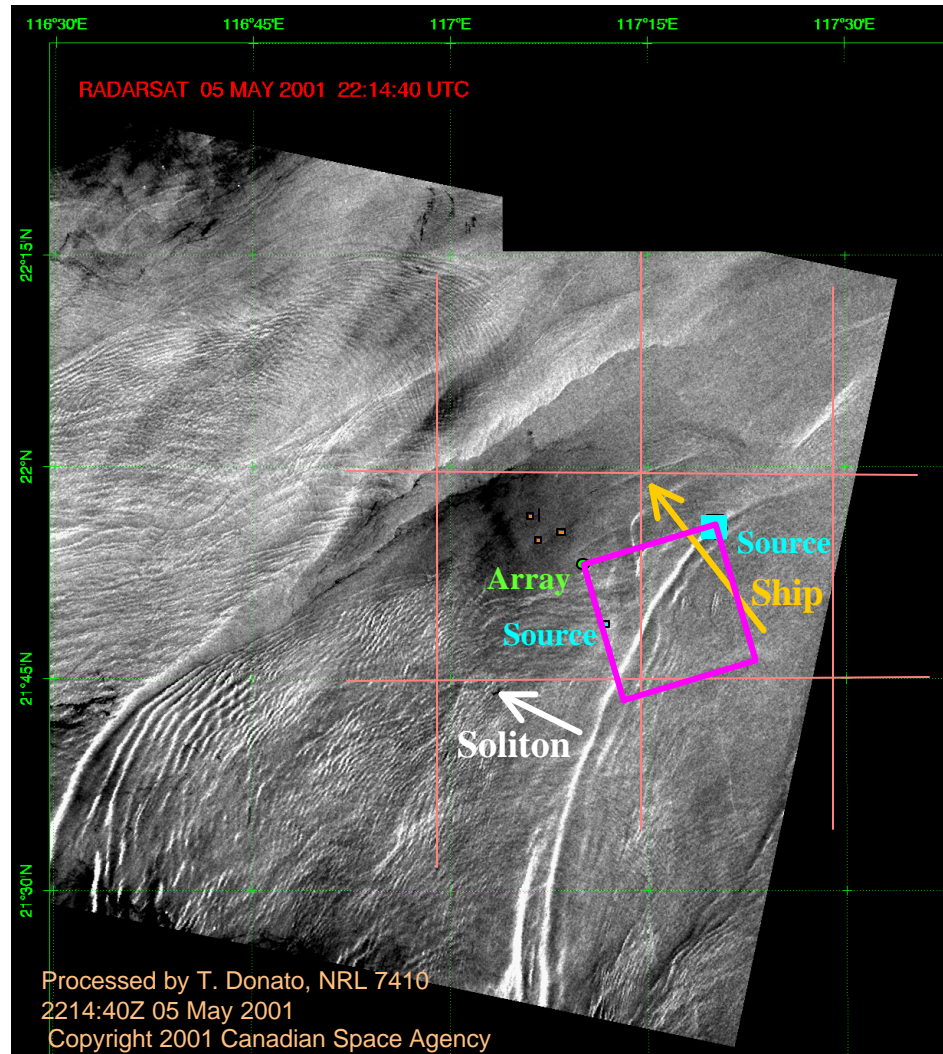


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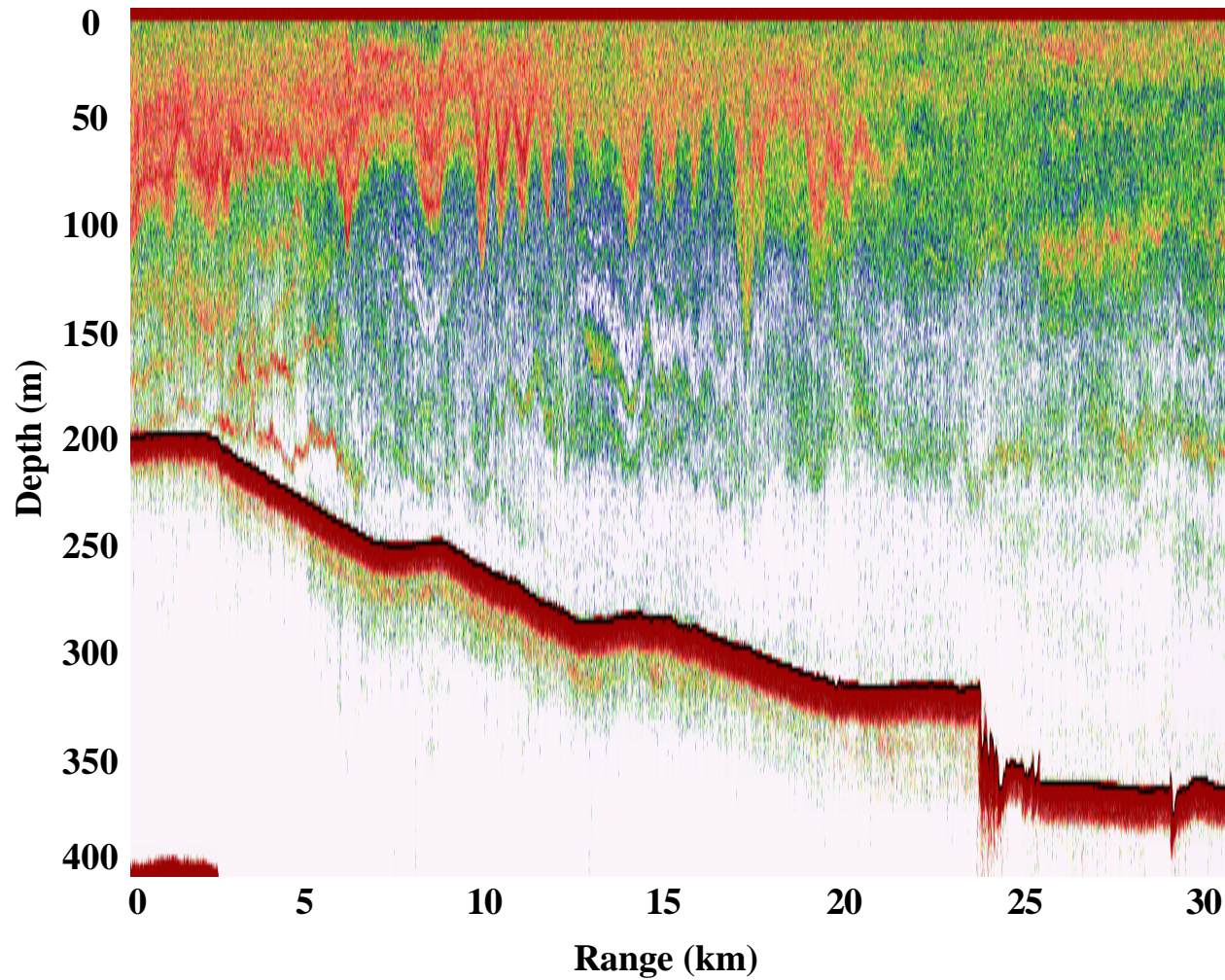
NRL

Deep Water Soliton

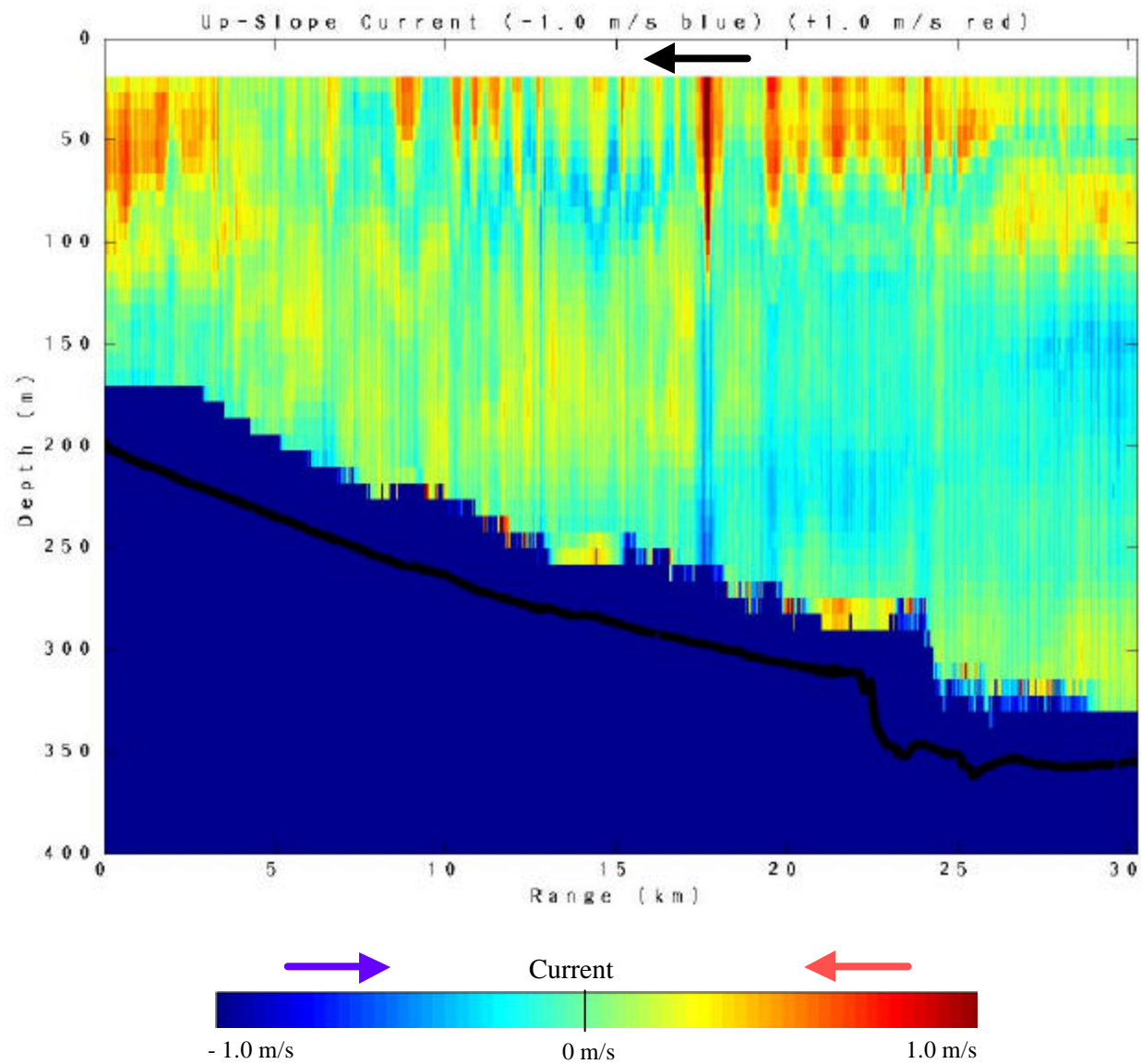
Radar Satellite Image



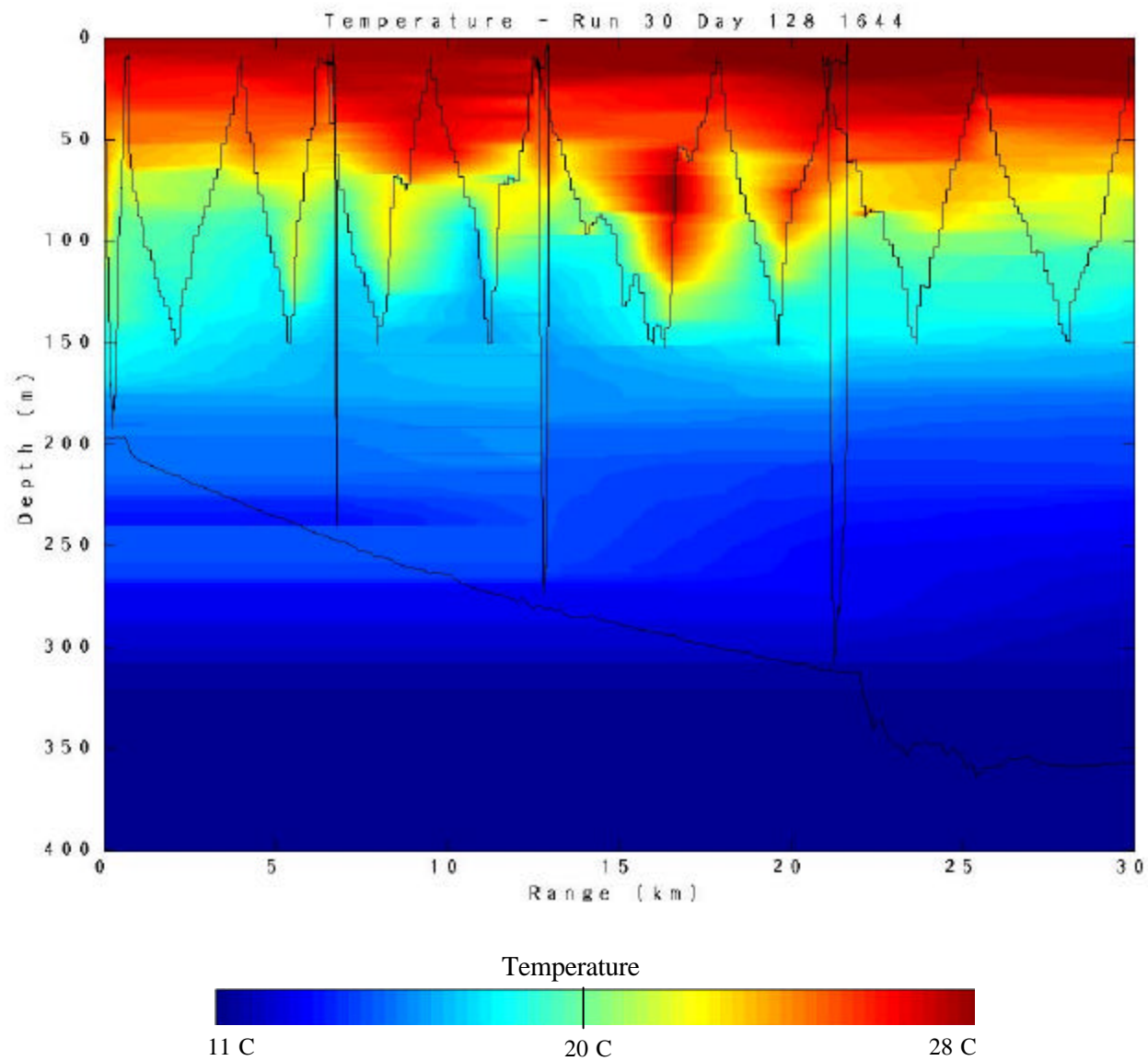
EP500 Echosounder



Up-Slope Current



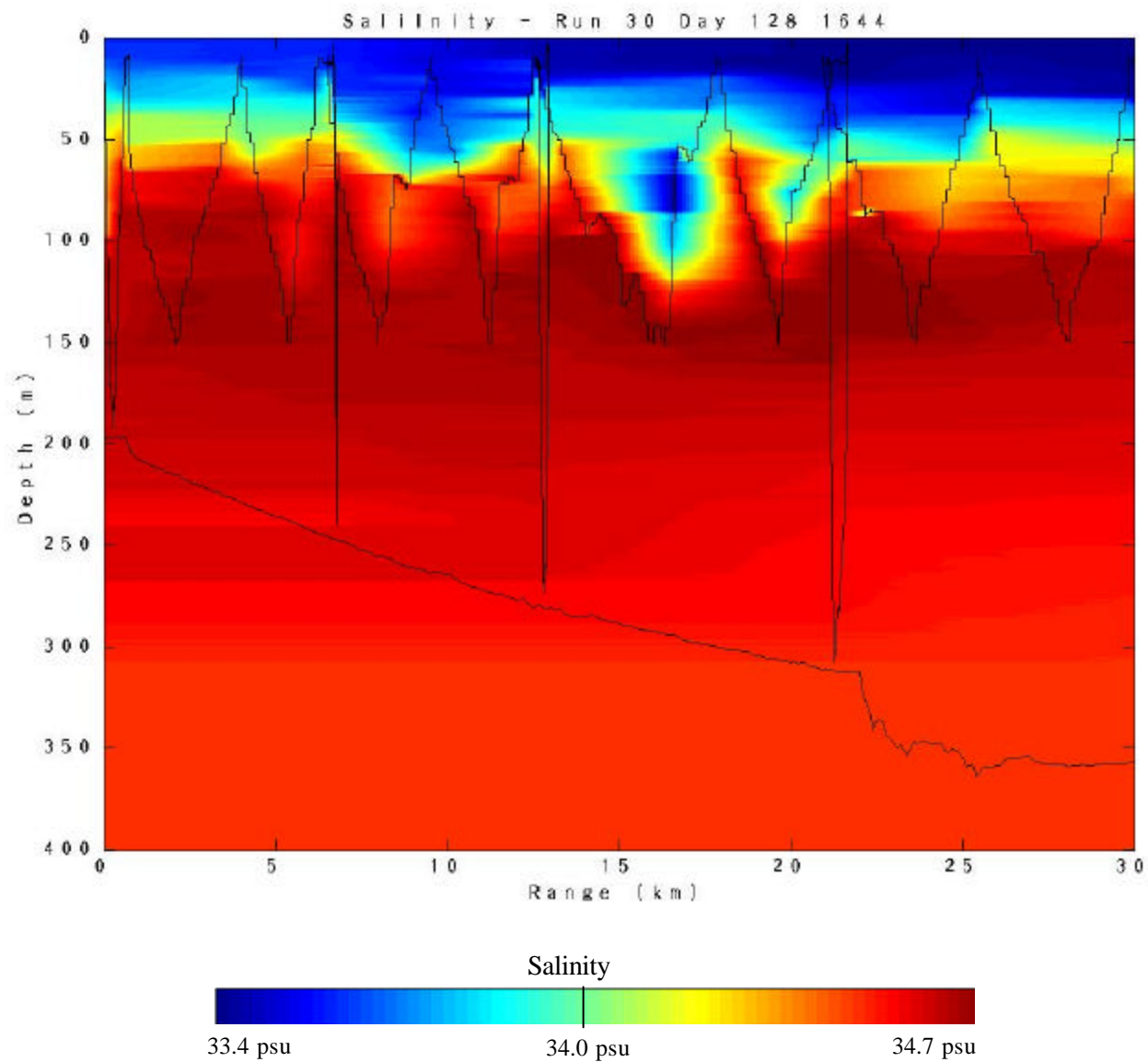
Temperature



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Salinity

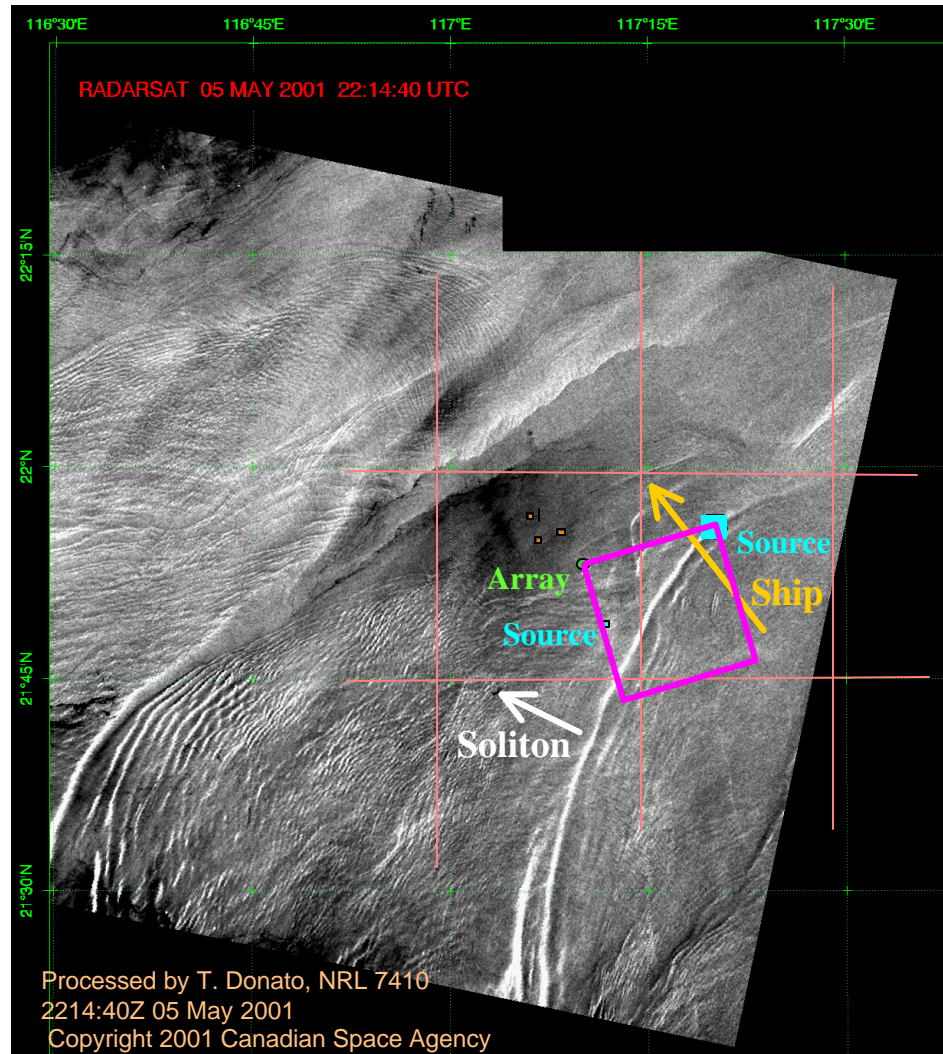


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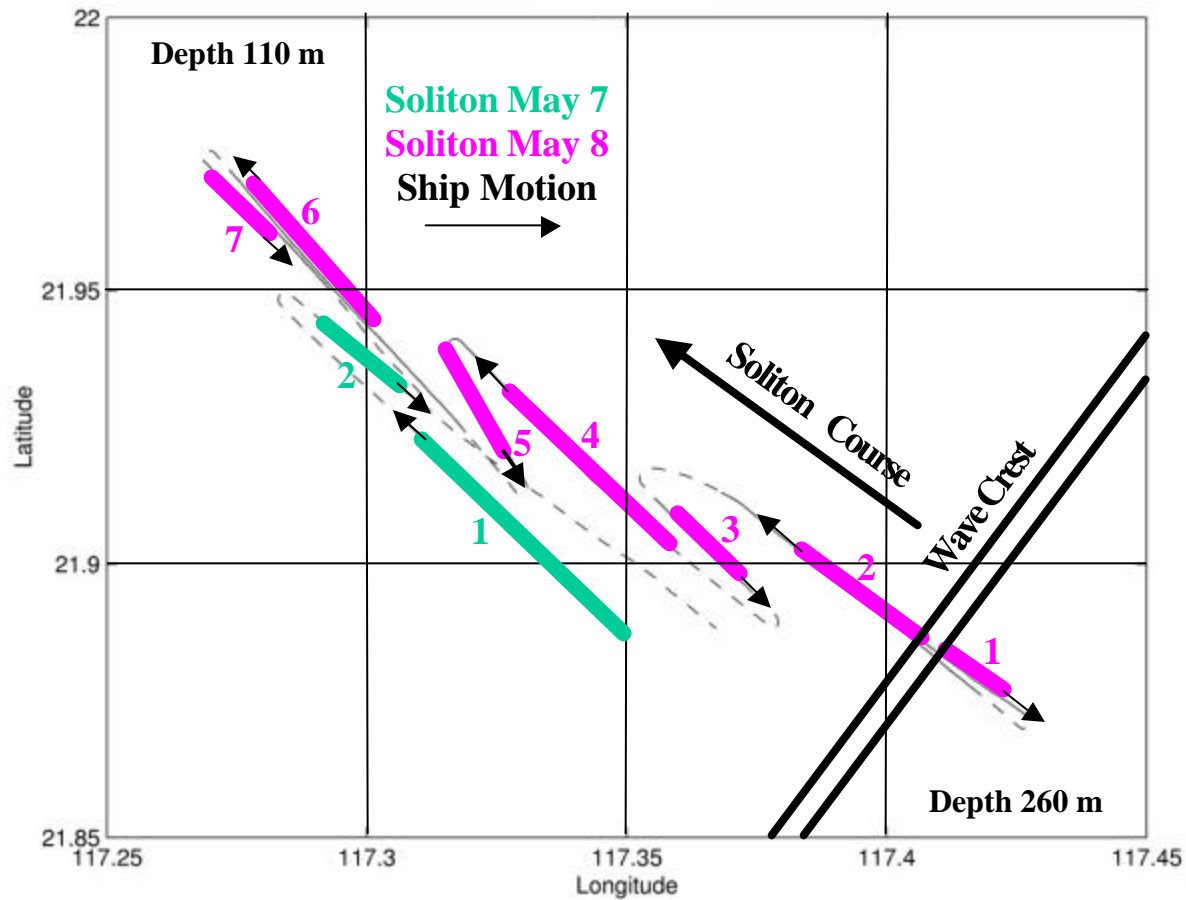
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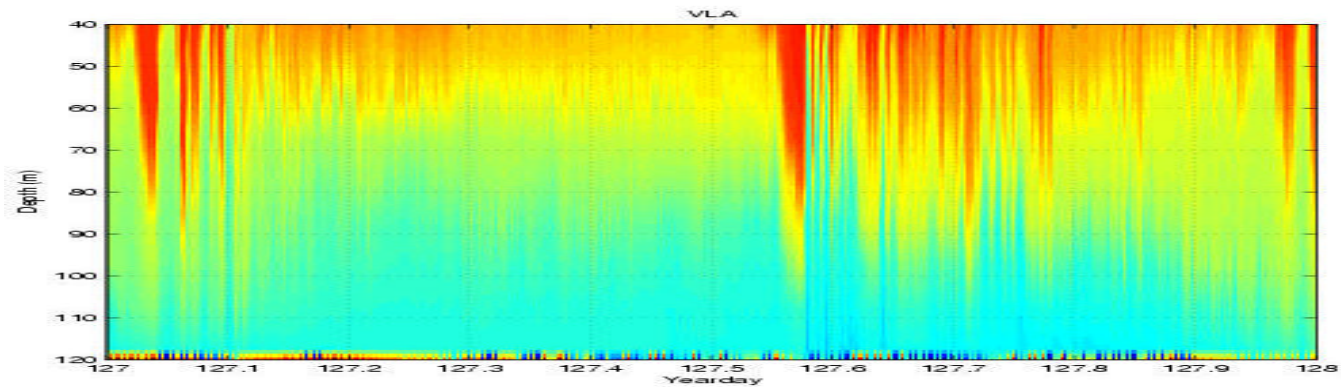
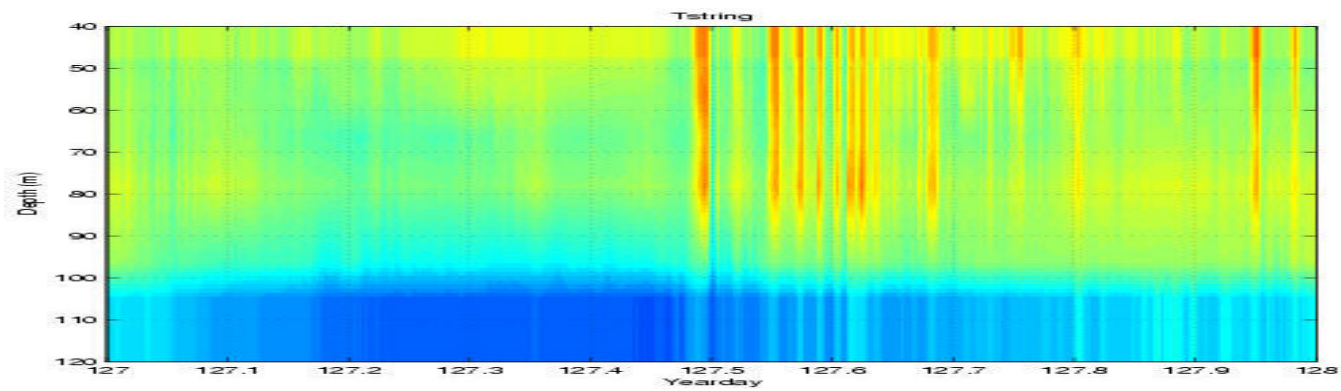
Shallow Water Soliton Conversion

Radar Satellite Image

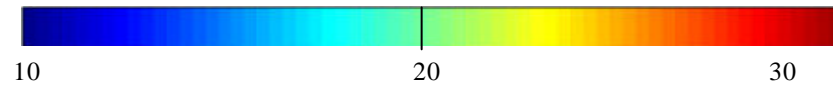


Soliton and Ship Tracks

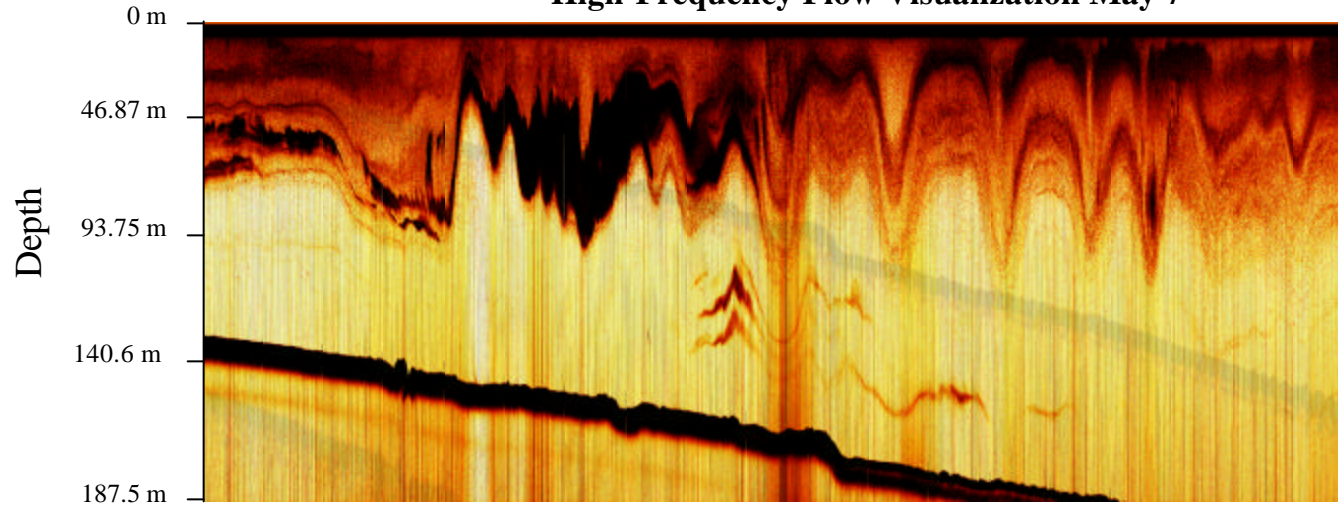


Vertical Array Temperature Pods May 7**Temperature String 307 May 7**

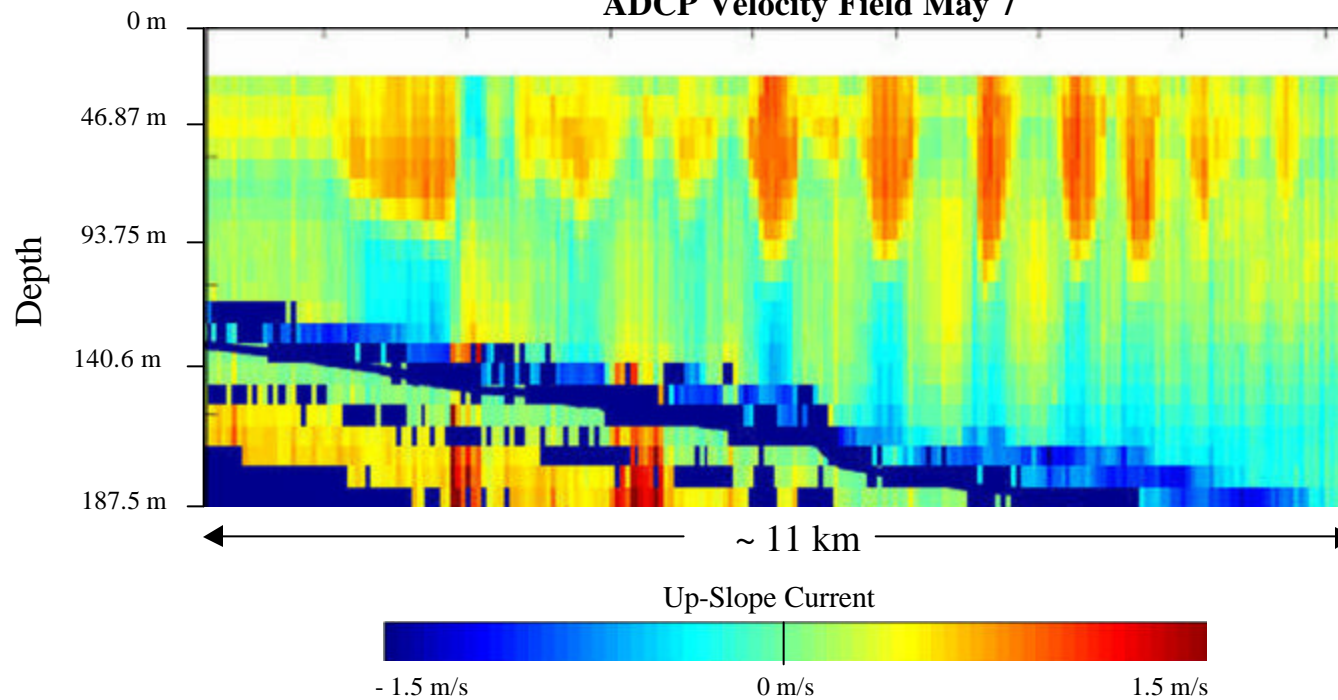
Temperature (C)

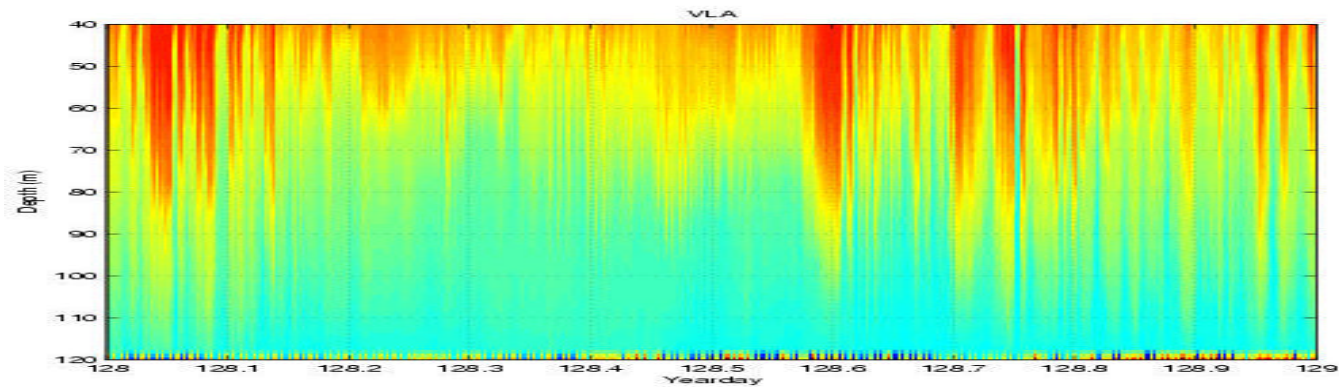
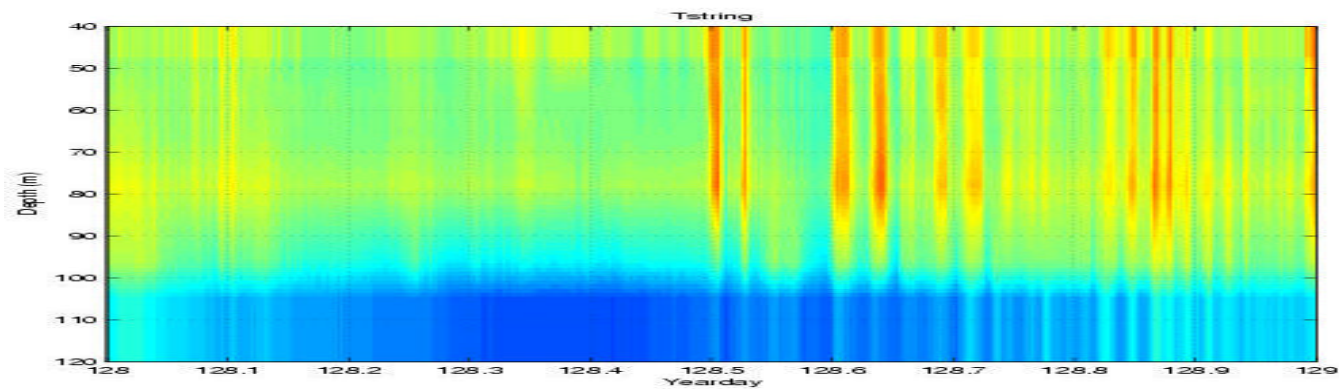


High-Frequency Flow Visualization May 7

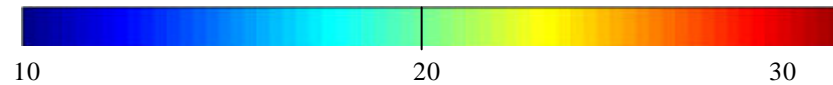


ADCP Velocity Field May 7



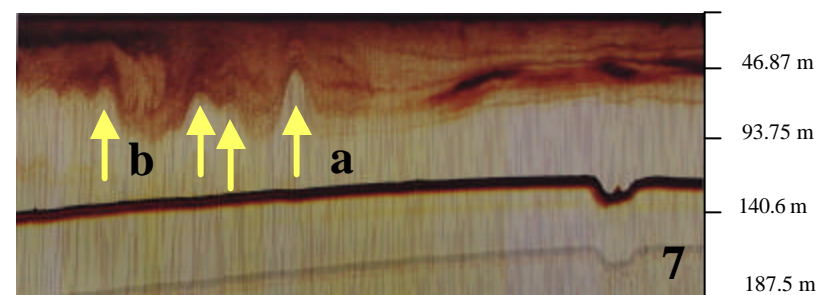
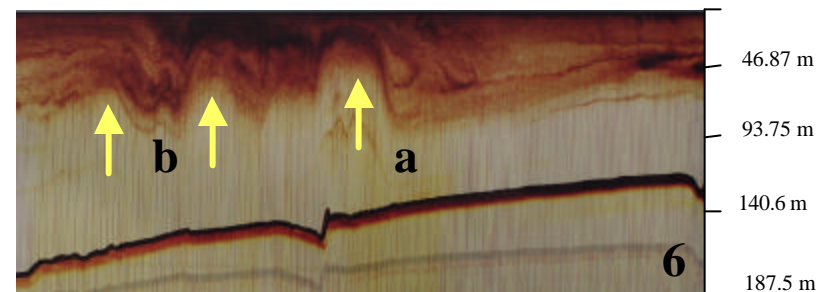
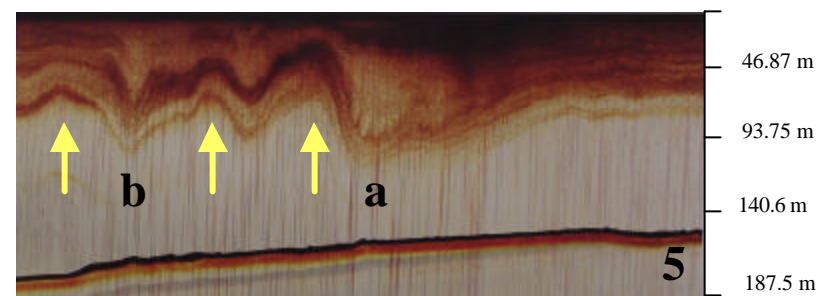
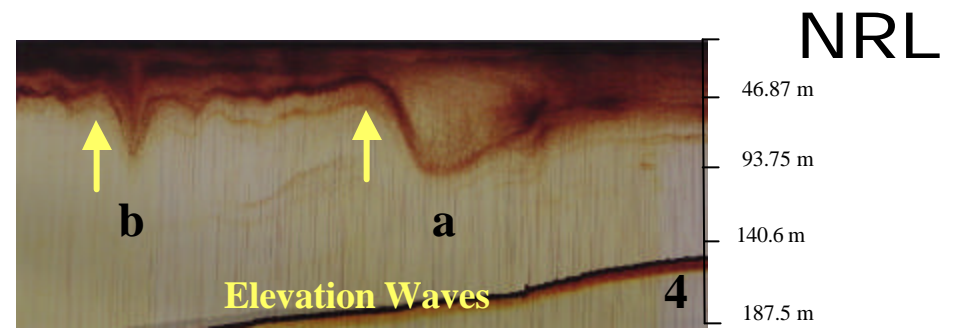
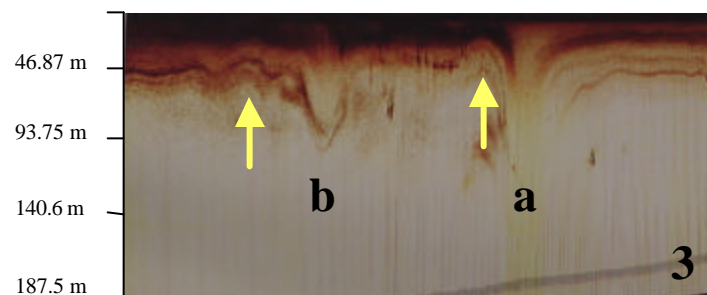
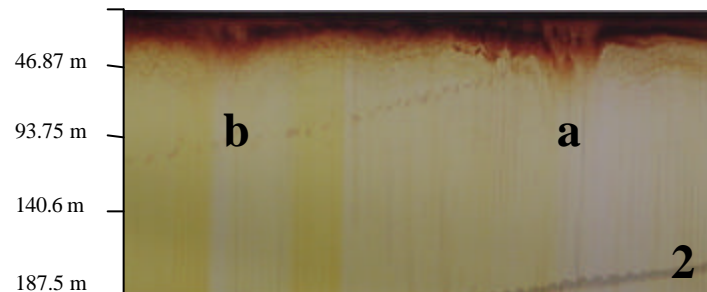
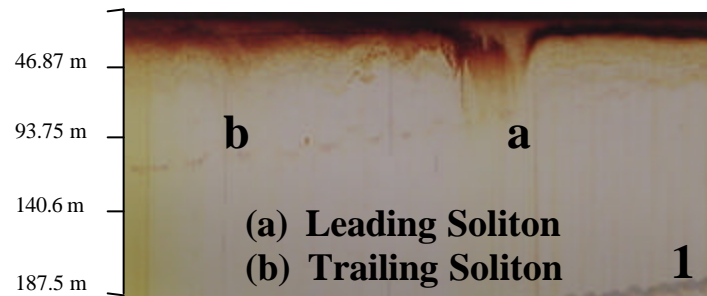
Vertical Array Temperature Pods May 8**Temperature String 307 May 8**

Temperature (C)



ONR

Soliton Evolution



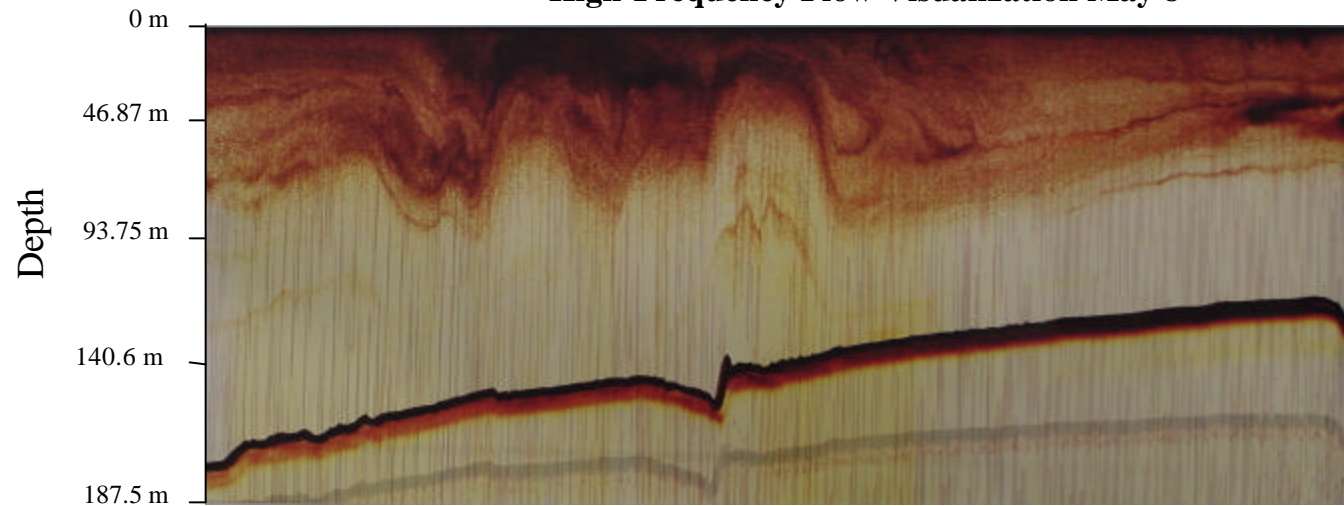
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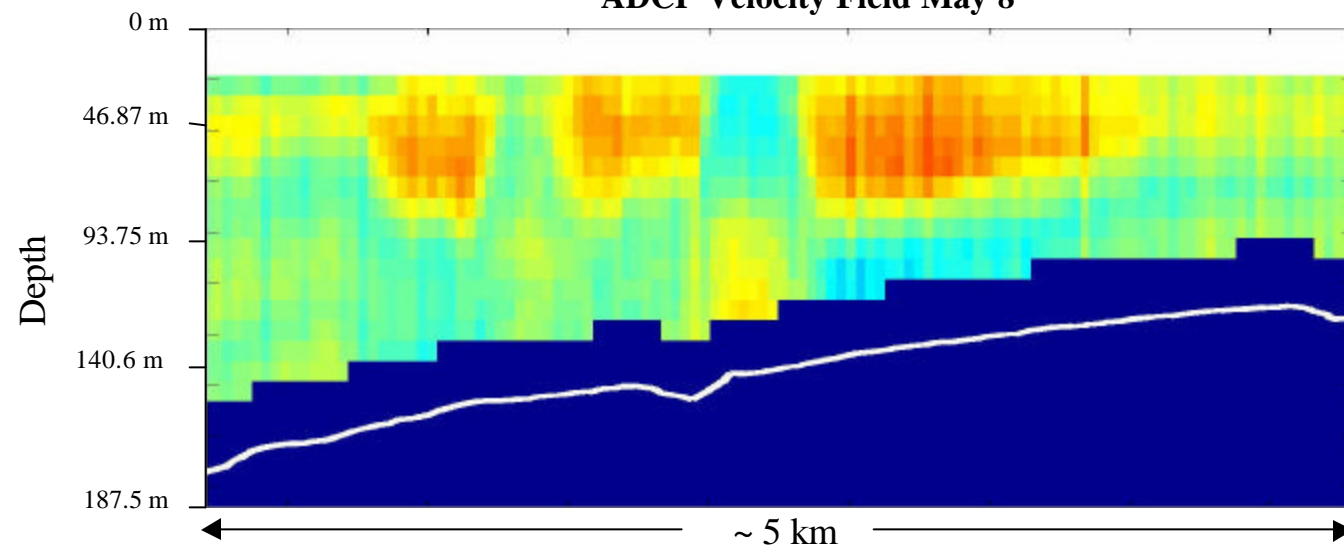
ONR

NRL

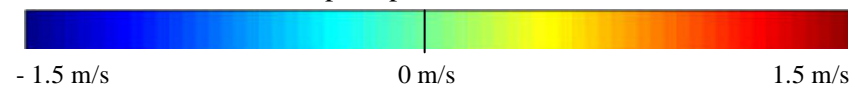
High-Frequency Flow Visualization May 8



ADCP Velocity Field May 8



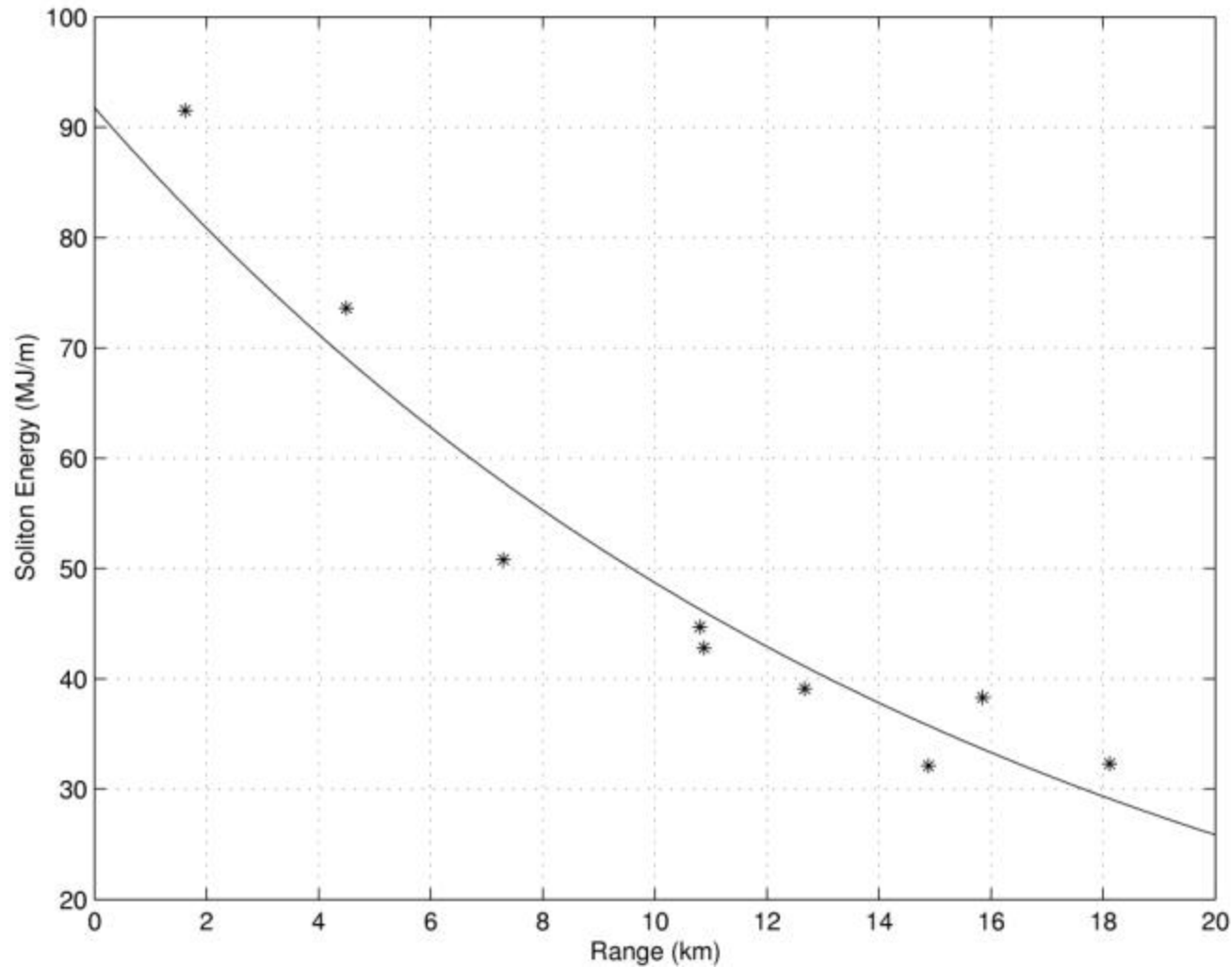
Up-Slope Current



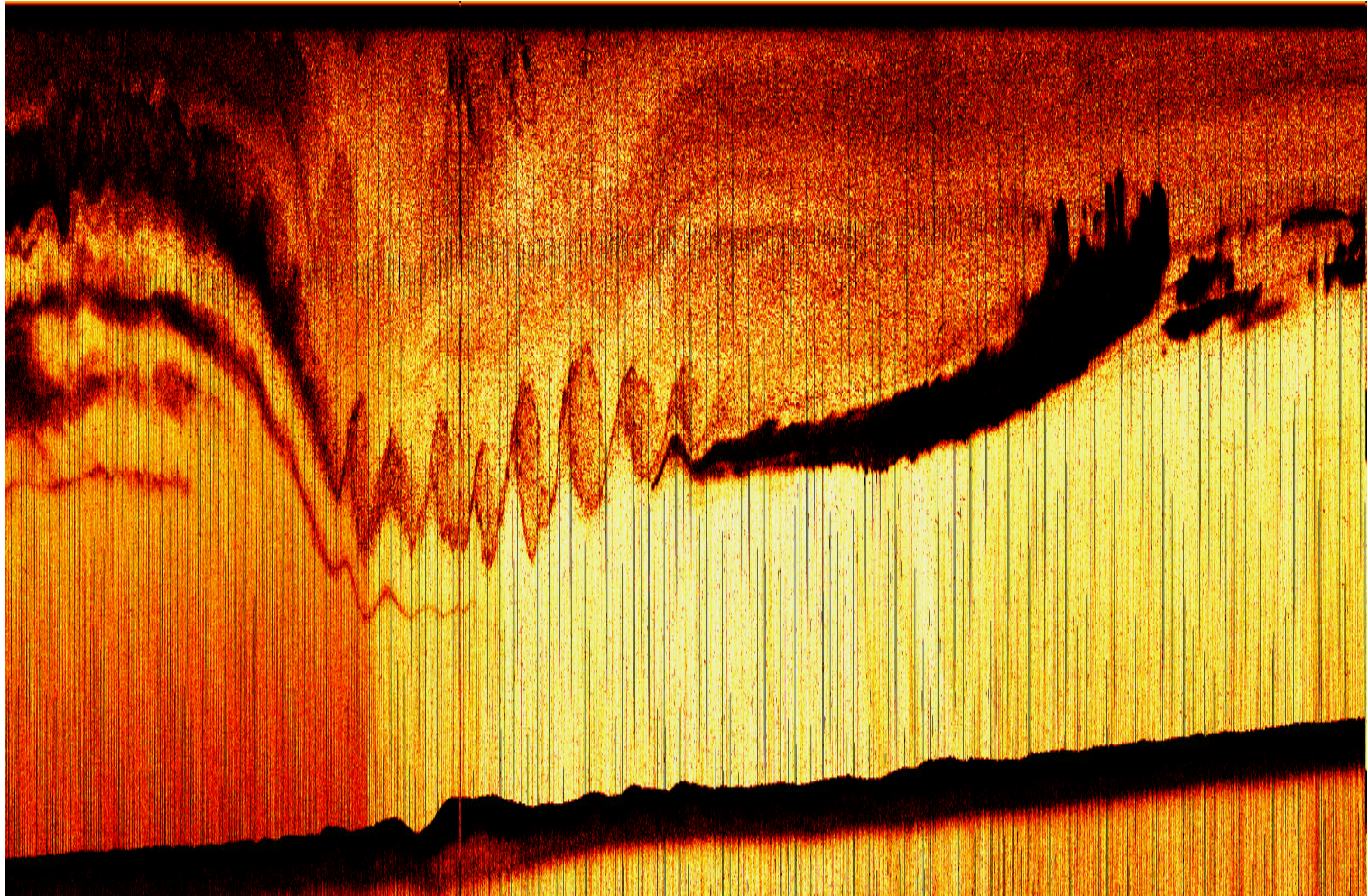
ASIAEX 2001

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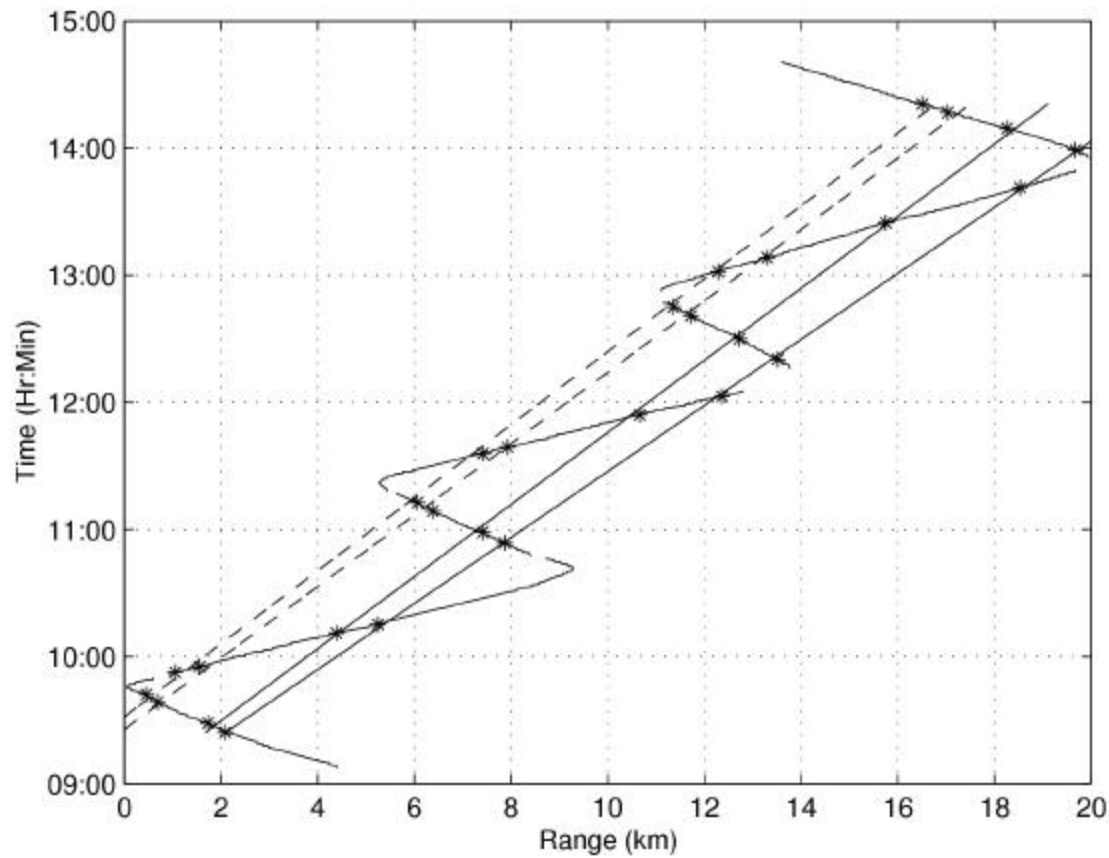
Soliton Energy Dissipation



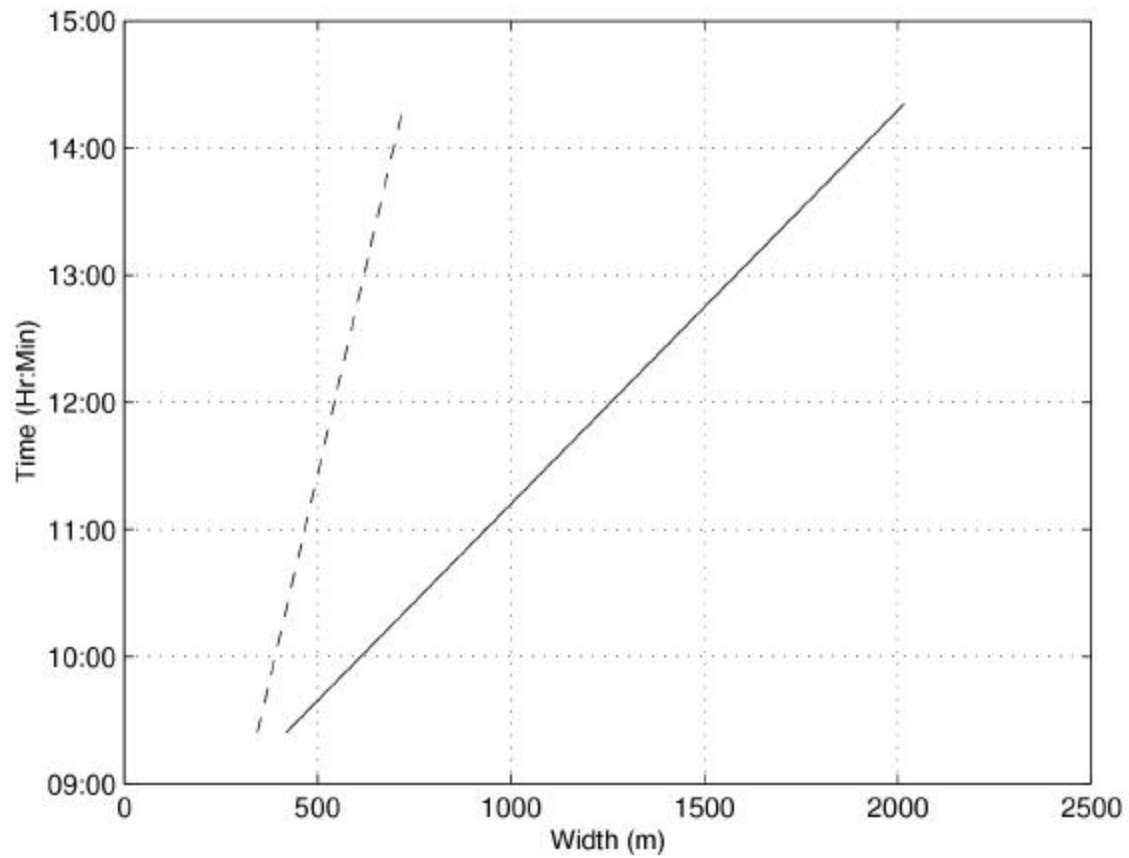
Shear Instability



Soliton Position



Soliton Width



Summary

Temperature and Salinity Legs 1-3

Surface water warmed and freshened

Deep water cooled and freshened

Thermocline steepened

Variability lessened

Deep Water Soliton

1.5 m/s currents

100 m vertical displacement of pycnocline

Extends 250 m to the bottom

Shallow Water Soliton Conversion

Conversion of depression solitons to elevation waves was observed

The internal wave train has alternating circulation cells

Kinetic energy is 91.2 MJ/m decreasing to 32.3 MJ/m

Energy dissipation is 0.17 W/m/m with rate coefficient 0.063 km^{-1}

Leading soliton width increases from 500 to 1000 m

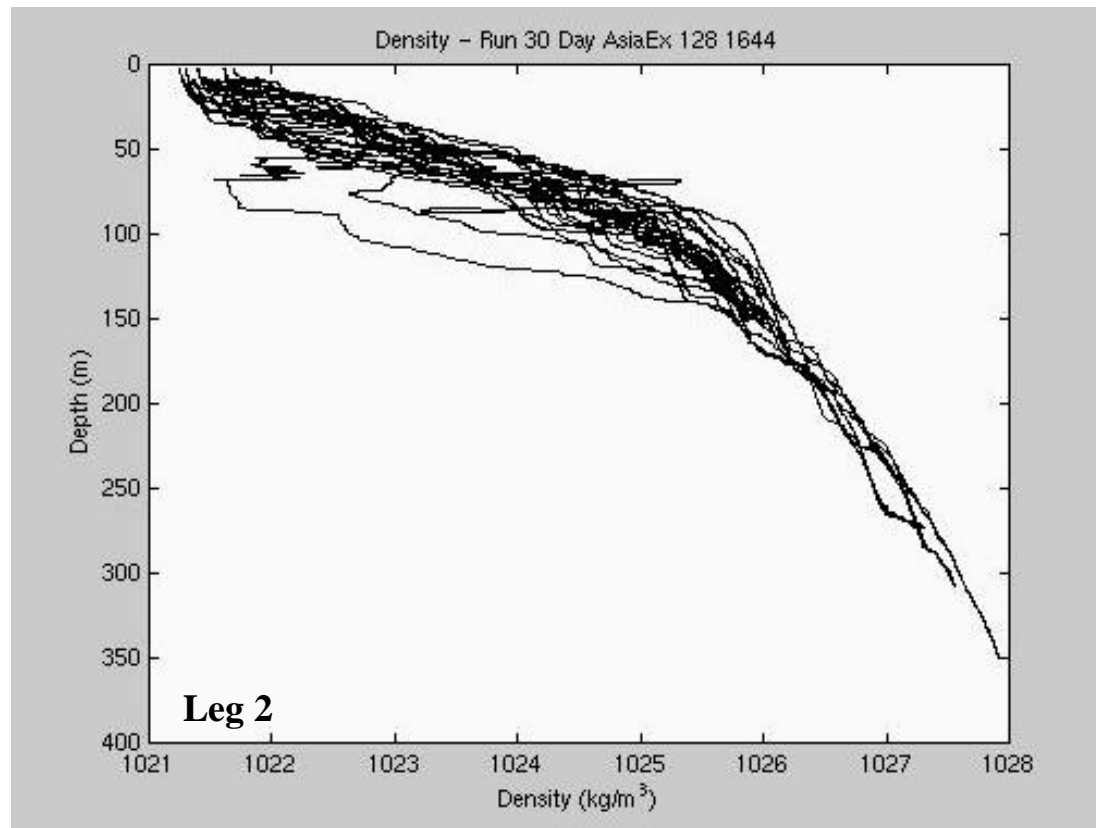
Publication

Paper in production at JGR Oceans

Marshall H. Orr and Peter C. Mignerey

“Nonlinear internal waves in the South China Sea - observation of the conversion of depression internal waves to elevation internal waves”

Density - Depth



Tow-Yo CTD Depth

